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UNIVERSITY OF ILLINOIS,

Agricultural Experiment Station.

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BULLETIN NO. 19.

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EXPERIMENTS WITH OATS, 1891.

THE CHINCH BUG IN ILLINOIS, 1891-92.

EXPERIMENTS WITH OATS, 1891.

This article gives results of experiments with oats conducted during 1891, in regard to rate of seeding, depth of sowing, and comparison of varieties. Comparisons are also made with results of similar experiments in previous years.

The trials were all made on the fertile, dark-colored prairie soil of the Station grounds. The season was unusually favorable for oats. In central Illinois, as well as over much of the United States, larger yields were reported than for many years past. The weight per bushel was also very large. The rainfall during the season of growth was unusually light—6.51 inches for April, May, and June, while the average for these months for ten years has been 12.68 inches. The rainfall during the autumn and winter preceding had also been very light—11.17 inches for the six months from October to March. The average temperature for the three months of growth was nearly the same as in 1890

RAINFALL AND TEMPERATURE.

	Average of 10 years.		1889.		1890.		1891.	
	Rain, in.	Temper- ature.	Rain, in.	Temper- ature.	Rain, in.	Temper- ature.	Rain, in.	Temper- ature.
April ...	3.19	52.4°	0.61	52°	4.11	52.3°	3.54	52.8°
May	4.45	64.6	5.52	59.2	3.56	58.3	0.89	58.4
June ...	5.04	71	6.81	65.5	3.8	74.6	2.08	72
	12.68		12.94		11.47		6.51	

and as the average for ten years, except in May, in which it was 6.2 degrees cooler.

In all cases, except in testing the effect of depth of covering, the oats were sown broadcast by hand.

The largest yield of grain was from sowing 3.5 bu. per acre, with little variation between the plats sown at rate of 2, 2.5, 3, 3.5 and 4 bu. per acre. The average yield for four years was slightly larger when 3.5 bu. were sown, with comparatively little difference whether 2, 2.5, 3, 3.5 or 4 bu. were sown. For the four years' sowings, one or one and one-half bu. gave smaller average yields than any of the heavier seedings. The weight of the grain per bushel was less in the case of the light seeding. The yield of straw increased with the increase in rate of seeding. For the two preceding years the lightest seeding gave the largest yield of straw. For the four years there was comparatively little difference in the yield of straw.

The results of the trials of different depths of planting were affected by other causes, yet seemed to give best returns from covering two inches deep, but without great variation from covering one to four inches deep. In trials for four years the best results have not come from covering the same depth in any two years.

In tests of 44 varieties on 55 plats the average yield per acre was 66.6 bu. of grain, weighing 33.5 lb. per bushel and 2,840 lb. of straw. Four varieties gave more than 80 bu., and but one less than 50 bu. per acre. Nineteen varieties on 21 plats gave an average yield of 74.7 bu., with averaging weight of 34.12 lb. per bushel.

In the seed sown there was an average of 71.7 per cent of kernel in the berry, and of 70.3 per cent in the crop. The Virginia winter, with the smallest yield and the lightest weight per bushel, had the largest per cent of kernel in the crop. The smallest per cent of kernel in the crop was 62.1 in a plat of welcome badly down; the other plats of welcome had a large percentage. Omitting these exceptional plats the greatest difference in per cent of kernel in seed was 16; in the crop, 11.8.

The early maturing varieties stood first in average yield of both grain and straw, weight per bushel, and size of kernels, but lowest in per cent of kernel. In 1890 these varieties gave the most grain but the least yield of straw and the lowest per cent of kernel.

The varieties with closed panicles gave a somewhat larger yield of both grain and straw and a larger per cent of kernel than those with open panicles. In 1890, there was little difference in yield.

The white varieties gave the largest average yield of grain and the smallest per cent of kernel; the black stood second in both respects; the few dun-colored stood lowest in yield and highest in per cent of kernel. In 1889, the order was the same throughout. In 1890, the dun-colored varieties stood first and the white last in yield.

No one variety has been shown to be greatly superior to all others. A different variety stood first in yield in each of the three years.

Not counting an exceptionally late variety, there was a difference of 24 days in date of cutting. Five varieties were cut July 6th and two July 30th. Of the 55 plats 28 were cut between July 16th and 20th.

The trials for three years do not show that the yield is determined either by the length, plumpness, or weight of the berry, or by the weight per bushel of the grain. The varieties with long, slender, light berries, and light weight per bushel, have had the largest per cent of kernel, and hence, the highest food value.

Experiment No. 12. Oats, Quantity of Seed per Acre.

The land used for this experiment had been in corn for three years, and was plowed and harrowed the day before the seeding.

April 16th 7 contiguous plats, each 1 x 16 rods, were sown broadcast with welcome oats, at the rate of from one to four bu. per acre, and covered by harrowing twice with a slant-toothed harrow.

When harvested, plat 1, which was sown at the rate of one bushel per acre, was slightly green. Each succeeding plat became more ripe to that of the thickest seeding, which was fully ripe and about 5 per cent lodged.

The following table gives the yield per acre of both grain and straw for each of the four years the experiment has been in progress; also the averages of the four years. For particulars of former seasons see bulletins No. 3, 7, and 12.

YIELD OF OATS FROM DIFFERENT AMOUNTS OF SEED, 1888, '89, '90, '91.

Seed per a., bu.	Grain, per acre, bu.					Straw, per acre, lb.					Lb. per bu.		
	1888.	1889.	1890.	1891.	Av.	1888.	1889.	1890.	1891.	Av.	1889.	1890.	1891.
1	52.5	36.3	25.3	36.7	37.7	3820	4600	2820	1275	3129	25.5	26	28.5
1.5	59.4	33.1	21.6	56.9	42.7	4400	3800	1740	1970	2978	25	26.5	31
2	61.4	42.5	17.5	74.8	49.1	4540	4000	1800	2748	3272	28	24	31.5
2.5	63.8	43.8	29.1	72.6	52.3	4860	3000	2460	2638	3240	28	29	32
3	61.9	47.2	27.5	76.6	53.3	5220	4400	1960	2790	3593	29	29	32.5
3.5	62.5	52.1	24.7	79.7	54.7	4400	4100	2000	3060	3390	29.5	28	32
4	60.6	50.6	21.9	76.3	52.3	4260	3200	2020	3110	3173	29.5	29	32

Experiment No. 15. Oats, Depth of Sowing.

April 8th 60 selected berries of welcome oats were sown in each of twelve rows, ten feet long. The first two rows were covered one inch deep, and each succeeding two rows one inch deeper, rows 11 and 12 being covered six inches deep.

June 16th the oats of rows 1 to 6 were looking fairly well; those of rows 7 to 12, much smaller and of a yellow color.

The sparrows so interfered with the grain that the actual yield could not be ascertained and only the number of panicles was counted for each row.

The relative yield is calculated from the number of panicles, supposing the relation to be the same as in 1890.

NUMBER OF PANICLES AND RELATIVE YIELD OF OATS SOWN AT DIFFERENT DEPTHS
FOR FOUR YEARS.

Depth of sowing, in.	1888.		1889.		1890.		1891.	
	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.
1	566	90	407	81	362	100	205	69
2	495	80	424	69	312	76	338	100
3	465	100	434	76	307	65	192	49
4	469	95	439	100	269	65	188	55
5	481	80	.....	.....	181	29	136	26
6	445	55	.....	.....	75	12	91	18

Experiment No 84. Oats, Test of Varieties.

The same varieties, 44 in number, have been tested on 55 plats in 1891 as in 1890. The seed, which was from the crop of 1890, was some mixed, notwithstanding the care taken to keep the varieties separate.

The land used in this experiment consists of three tracts. Tracts (a) and (b), separated by a space of 20 feet, and containing plats 1 to 40, had been in corn for three years. Tract (c), which was 30 rods northwest of (b), contained plats 41 to 52, and had been in corn in 1890 and in oats in 1889. The land was all fall-plowed without removing the stalks.

April 8th plats 1 to 28 were disked lengthwise, sown broadcast with oats at the rate of $2\frac{1}{2}$ bu. per acre by weight, disked crosswise, seeded with clover, and harrowed lightly with a slant-toothed harrow. April 13th plats 29 to 52 were sown, the treatment and quantity of seed being the same as of the other plats.

DUPLICATE PLATS.

In order to determine the degree of inaccuracy incident to the experiment, seven varieties were sown on duplicate plats, as shown in the following table. The duplicates were so arranged as to give the maximum variation likely to occur on the tracts used.

Leaving out of consideration plat 38, of welcome, which was nearly all lodged, the average difference in yield of grain between two plats of the same variety was 6.6 bu. per acre; the least difference, 1 bu., and the greatest difference, 19.9 bu.

A yield of 6.6 bu. per acre by one variety above that of another does not therefore necessarily indicate that, for this season, the one is superior to the other. The varieties giving the largest yield, and also those yielding the least, were widely distributed over the tracts used.

The average difference in the weight of a bushel of oats from plats of the same variety was about 6-7 lb.; the greatest difference, $1\frac{1}{2}$ lb. There seems to be no relation between the yield of oats and the weight per bushel, the size of berries, or the per cent. of kernel.

YIELD OF DUPLICATE PLATS IN 1891.

Name of variety.	Yield per acre.		Lb. straw for each lb. grain.	Lb. per bu.	Ht., in.	No. stubs per sq. ft.	Wt. 100 berries, grams.	Percent. kernel in berries.
	Grain, bu.	Straw, lb.						
Welcome	75	2840	1.18	33.5	41	37	2.56	70.4
"	72.5	3240	1.4	34.25	42	45	2.48	71.3
"	52.3	2705	1.62	35.25	.....	30	2.51	62.1
"	73.7	3500	1.48	32.75	41	34	2.63	68.2
Texas red	63.4	2110	1.04	33	37	39	2.62	74.7
" "	56.6	2750	1.52	34.5	.....	.....	.....	.....
" "	58.7	2440	1.3	34	.....	.....	.....	.....
" "	64.4	2580	1.25	33.5	.....	.....	.....	.....
Pringle's progress..	83.4	2850	1.07	28	38	38	2.34	67.9
"	74.7	2450	1.03	27.75	33	32	2.65	64.5
Early Dakota	56.6	2470	1.36	30.75	38	46	2.03	73.4
"	70.8	2895	1.28	31.25	39	32	2.15	74.5
New red rust proof.	61.9	2040	1.03	31	35	33	2.7	74.3
" " "	67.4	2425	1.13	31.75	35	32	2.86	72.5
Canadian black....	52.3	3005	1.79	32	40	35	2.33	73
"	59.2	2925	1.54	30.75	38	43	2.28	76.3
Black Russian.....	80.8	3495	1.35	31.75	42	43	2.22	71.4
"	60.9	2010	1.03	30.75	35	29	2.37	71.4

SYNOPSIS OF VARIETIES.

The same scheme is used in the table, on page 38, as in bulletin No. 12, for the crop of 1890, and, with the following exceptions, the classification is the same:

The varieties, Texas rust proof, Texas red, and new red rust proof, have been changed from the early-maturing to the medium, the last coming also in the late. The variety welcome comes in both the early and the medium. Canada white and Swedish have been changed from the open paniced to the closed; prolific side, common mixed, white Russian, improved white Russian, and black Highlander from the closed to the open; prolific side from berry long to short and Swedish from short to long.

The early-maturing varieties are those harvested July 6th to 14th; the medium, July 16th to 20th, and the late, July 24th to 30th, excepting Virginia winter, which was harvested Aug. 7th, and, being a winter variety, may be left out of the account.

YIELD.

The yield of grain was unusually large, being for the 55 plats an average of 66.6 bu. per acre, and the yield of straw was 2,840 lb. per acre. In 1889 and 1890, respectively, the average yield of grain per acre was 41.2 and 35.2 bu. and of straw, 2,394 and 3,063 lb. For details, see tables on pp. 39-41.

QUALITY.

The average per cent of kernel in the berries of the seed was 71.7; of the crop, 70.3, which was a decrease of 1.4 per cent.

SYNOPSIS OF VARIETIES.

Yield, bu.

Oats.	Early.	Panicle open..	{	White	{	Berry long..	{	Early Dakota.....63.7	}	71 3						
						Pringle's progress.....79										
						Berry short.	{	White Swede.....72.3			}	69.8				
								Early Lackawanna.....66.2								
								White bonanza.....70.3								
								Second premium.....72								
								Welcome.....74.3								
								White Victoria.....66.6								
								Clydesdale.....73.1								
								Hopetown.....67.7								
								White wonder.....58.7								
								Prize cluster.....70.5								
								Badger queen.....70.6								
								White Belgian.....70.9								
	Hargett's white.....61.1															
	Centennial.....62.3															
	Panicle closed..	{	White	{	Berry short.	{	Canada white.....63.9	}								
Medium.	Panicle open..	{	White	{	Berry long.	{	White schonen.....67.2	}	70.1							
					American banner.....73.4											
					American triumph.....69.7											
					Berry short.		{			Welcome.....62.4	}	63.2				
										Prolific side.....56.7						
										Wide awake.....58.3						
					Improved American....75.2											
					Panicle closed..		{			Black.	{	Berry long..	{	Black Tartarian.....58.3	}	
												Dun..		{		Berry long..
	Texas red.....60.8															
	New red rust proof....61.9															
	Panicle closed..	{	White	{		Berry long..		{	Swedish.....65			}		68		
					Berry short	{	Japan.....75.8		}							
							Baltic white.....67.2									
Probstier.....65																
Egyptian.....64.1																
Panicle closed..	{	Black	{	Berry long..	{	Black Russian.....70.8	}	72.7								
				New Dakota gray.....85												
				Black prolific.....68.7												
				Prince Edward's Island.66.2												
Late.	Panicle open..	{	White	{	Berry long..	{	Common mixed.....67.2	}	74.6							
					White Russian.....76.4											
					Imp. white Russian....80.3											
					Black		{			Berry long..	{	Canadian black.....55.8	}	60.9		
										Black Highlander.....65.9						
					Dun..		{			Berry long..	{	Virginia winter.....15.9	}	41.7		
										New red rust proof....67.4						
					Panicle closed..		{			White	{	Berry long..	{	Golden giant side.....68	}	68.6
												Giant yellow French...69.2				

Omitting the variety Virginian winter, Canadian black has the largest per cent of kernel in both seed and crop; and, omitting plat 38 of welcome, which was badly down, Clydesdale has the lowest per cent of

COMPARATIVE YIELD OF VARIETIES OF OATS—1891.

Plat No.	Name of variety.	Comparative yield.
23	New Dakota gray . . .	85
5	Pringle's progress . . .	83.4
21	Black Russian	80.8
46	Imp. white Russian . . .	80.3
45	White Russian	76.4
27	Japan	75.8
33	Improved American . . .	75.2
31	Welcome	75
52	Pringle's progress . . .	74.7
47	Welcome	73.7
35	American banner	73.4
13	Clydesdale	73.1
22	Welcome	72.5
6	White Swede	72.3
1	Texas rust proof	72.2
10	Second premium	72
18	White Belgian	70.9
50	Early Dakota	70.8
17	Badger queen	70.6
16	Prize cluster	70.5
9	White bonanza	70.3
36	American triumph	69.7
43	Giant yellow French . . .	69.2
24	Black prolific	68.7
42	Golden giant side	68
14	Hopetown	67.7
51	New red rust proof	67.4
44	Common mixed	67.2
34	White schonen	67.2
28	Baltic white	67.2
12	White Victoria	66.6
25	Prince Edward's Is. . . .	66.2
7	Early Lackawana	66.2
41	Black Highlander	65.9
29	Probsteir	65
31	Swedish	65
30	Egyptian	64.1
8	Canada white	63.9
20	Centennial	62.3
3	New red rust proof	61.9
19	Hargett's white	61.1
49	Black Russian	60.9
....	Texas red (Av. 4 plats)	60.8
48	Canadian black	59.2
15	White wonder	58.7
37	Black Tartarian	58.3
32	Wide awake	58.3
26	Prolific side	56.7
4	Early Dakota	56.6
39	Canadian black	52.3
40	Virginia winter	15.9

kernel in the seed, and Pringle's progress the lowest in the crop. The greatest difference in the seed of two varieties is 16 per cent; in the crop, 11.8 per cent.

YIELD OF OATS OF DIFFERENT VARIETIES; WEIGHT PER BUSHEL; DATE OF RIPENING; WEIGHT OF BERRIES; PER CENT OF KERNEL; NUMBER OF STUBS PER SQUARE FOOT,—1891.

No. of plat.	Name of variety.	Yield per acre		Lb. straw for each lb. grain.	Lb. per bu.	Height, inches.	Ripe and cut July.	Wt. of 100 berries in grams.		Per cent of kernel in berries.		No. of stubs on 1 sq. ft.	Condition when cut.
		Grain, bu.	Straw, lb.					In seed.	In crop.	In seed.	In crop.		
1	Texas rust proof.	72.2	2250	0.97	32	37	16	2.71	2.6	74.5	75.5	42	All standing.
2	Texas red.	63.4	2110	1.04	33	37	16	2.37	2.62	75.8	74.7	39	All standing.
3	New red rust proof.	61.9	2040	1.03	31	35	16	2.78	2.7	73.6	74.3	33	All standing.
4	Early Dakota.	56.6	2470	1.30	30.75	38	9	2.34	2.03	73.6	73.4	46	All standing.
5	Pringle's progress.	83.4	2850	1.07	28	38	6	2.11	2.34	70.5	67.9	38	All standing.
6	White Swede.	72.3	3225	1.39	37.75	45	6	2.5	2.73	66.7	66.2	31	Mostly standing.
7	Early Lackawanna.	66.2	2980	1.41	35.75	44	6	2.34	2.3	68.1	68.3	34	Mostly standing.
8	Canada white.	63.9	3275	1.6	37	46	9	2.46	2.56	66.1	70.3	34	25% down.
9	White bonanza.	70.3	2950	1.31	36.75	44	6	2.53	2.61	64.9	66.2	36	Mostly standing.
10	Second premium.	72	2815	1.22	37.25	45	6	2.33	2.73	66.9	67.3	37	Mostly standing.
11	Welcome.	75	2840	1.18	33.5	41	9	2.06	2.56	69.4	70.4	37	All standing.
12	White Victoria.	66.6	2910	1.37	38	42	9	2.21	2.57	68.9	74	26	All standing.
13	Clydesdale.	73.1	3000	1.28	40.5	47	9	2.24	2.92	64.8	69.4	33	All standing.
14	Hopetown.	67.7	2715	1.25	38	46	9	2.13	2.86	66.6	68.2	40	All standing.
15	White wonder.	58.7	2320	1.23	40.5	45	9	2.42	2.96	65.7	67.8	43	All standing.
16	Prize cluster.	70.5	3025	1.34	34.75	44	9	2.31	2.63	68	67.9	37	All standing.
17	Badger queen.	70.6	3080	1.36	38.25	47	9	2.35	2.73	66.6	68.8	35	All standing.
18	White Belgian.	70.9	3270	1.44	37.25	48	9	2.16	2.75	66.1	66.5	40	Mostly standing.
19	Hargett's white.	62.1	2685	1.37	35.5	47	9	2.2	2.67	67.3	65	31	All standing.
20	Centennial.	62.3	3125	1.57	36.75	45	9	2.33	2.56	70.7	69.1	35	10% down.
21	Black Russian.	80.8	3495	1.35	31.75	42	20	2.06	2.22	75.8	71.4	43	All standing.
22	Welcome.	72.5	3240	1.4	34.25	42	16	2.06	2.48	69.4	71.3	45	Mostly standing.
23	New Dakota gray.	85	3760	1.38	32.75	42	20	2.26	2.43	74	69.4	37	All standing.

24	Black prolific.....	68.7	4520	2.05	29.75	43	20	2.24	2.24	73.9	69.5	41 40% down
25	Prince Edward's Island	66.2	3280	1.55	33.25	40	20	2.33	2.38	72	69.8	30 All standing
26	Prolific side.....	56.8	2665	1.47	35.25	43	16	2.19	2.40	72.3	71.8	36 All standing
27	Japan	75.8	3435	1.42	39.25	44	16	2.51	2.49	71.4	71.9	39 All standing
28	Baltic white.....	67.2	4150	1.93	39.75	48	16	2.34	2.54	71.5	70.5	34 Mostly standing
29	Probstier	65	2440	1.17	36.25	40	16	2.55	2.53	72.1	68.9	27 All standing
30	Egyptian.....	64.1	2590	1.26	37.5	42	16	2.46	2.5	70.8	71.3	30 All standing
31	Swedish	65	2320	1.12	32	40	16	2.18	2.57	74.6	71.7	34 All standing
32	Wide awake.....	58.3	2375	1.27	32.5	40	16	2.44	2.75	74.5	72.4	33 All standing
33	Improved American.....	75.2	2775	1.15	33	42	16	2.82	2.54	68.7	72.3	38 All standing
34	White schonen.....	67.2	2770	1.29	34.5	40	16	2.45	2.51	74.8	74.1	32 All standing
35	American banner.....	73.4	2430	1.03	33.5	41	16	2.72	2.57	72.3	72.7	34 All standing
36	American triumph.....	69.7	3050	1.37	30	42	16	1.98	2.11	73.5	71.6	38 Mostly standing
37	Black Tartarian	58.3	2915	1.56	29.75	43	20	1.79	2.15	65	65.4	39 50% down
38	Welcome.....	52.3	2705	1.62	35.25	—	16	2.06	2.51	69.4	62.1	39 75% down
39	Canadian black.....	52.3	3005	1.79	32	40	30	2.06	2.33	80.8	73	35 All standing
40	Virginia winter.....	15.9	2410	4.73	22.25	32	Aug. 7	2.29	2.41	78.4	78.8	39 Mostly standing
41	Black Highlander.....	65.9	2490	1.18	29.75	33	July 24	2.24	2.57	72.1	68.9	32 All standing
42	Golden giant side.....	68	2505	1.15	28.75	36	24	2.51	2.67	79.1	70.7	28 All standing
43	Giant yellow French.....	69.2	2445	1.1	29.25	35	24	2.63	2.58	76.3	70	39 All standing
44	Common mixed.....	67.2	2270	1.06	32	36	24	2.4	2.63	77	66.8	36 All standing
45	White Russian	76.4	3055	1.25	29.75	40	24	2.63	2.66	77.3	67.4	35 All standing
46	Imp. white Russian	80.3	3170	1.23	32	43	24	2.32	2.77	74.9	71.6	34 All standing
47	Welcome	73.7	3500	1.48	32.75	41	14	2.06	2.63	69.4	68.2	34 All standing
48	Canadian Black	59.2	2925	1.54	30.75	38	30	2.06	2.28	80.8	76.3	43 All standing
49	Black Russian.....	60.9	2010	1.03	30.75	35	20	2.06	2.37	75.8	71.4	29 All standing
50	Early Dakota	70.8	2895	1.28	31.25	39	14	2.34	2.15	73.6	74.5	32 All standing
51	New red rust proof	74.7	2425	1.13	31.75	35	24	2.78	2.86	73.6	72.5	32 All standing
52	Pringle's progress.....	52	2450	1.03	27.75	33	9	2.14	2.65	70.5	64.5	32 All standing
x	Texas red.....	56.6	2750	1.52	34.5	..	16	....	....	....	....	All standing
y	Texas red.....	58.7	2440	1.3	34	..	16	....	....	....	....	All standing
z	Texas red.....	64.4	2580	1.25	33.5	..	16	....	....	....	....	All standing
Average.....		66.6	2840	1.38	33.55	41	..	2.30	2.54	71.7	70.3	36

From the table of varieties classified, below, it will be seen that the early-maturing varieties are superior to either the medium or late in the average yield of both grain and straw, the weight per bushel and size of berries; but are inferior to either of these in per cent of kernel. As to berries short plump, and long slender, there is very little difference in yield, a noticeable difference in weight per bushel in favor of the short plump, and a difference of 2.1 per cent in kernel in favor of the long slender.

As to berries, white, black, or dun-colored, the white gave the largest yield of grain and the smallest per cent of kernel; the dun-colored gave the smallest yield and the largest per cent of kernel.

As to panicles open or closed, the latter is superior in yield of both grain and straw and also in per cent of kernel.

As to weight per bushel, those which weigh less than 32 pounds are superior in both yield and per cent of kernel. Notwithstanding the common belief to the contrary, those oats which weigh least to the bushel have usually the highest per cent of kernel, and, consequently, the highest food value. Take, for a striking example, the variety Virginia winter. This season it was least in yield of grain, 15.9 bu., and in weight per bushel, 22¼ lb., but highest in per cent of kernel, 78.8.

YIELD, WEIGHT, PER CENT. OF KERNEL IN VARIETIES AS CLASSIFIED, 1891.

Classification.	No. of plats.	Yield per acre.		Lb. straw for each lb. grain.	Lb. straw per bu.	No. stubs on 1 sq. ft.	Height, in.	Wt. of 100 berries in grams.		Per cent. of kernel in berries.	
		Grain, bushels.	Straw, pounds.					In seed.	In crop.	In seed.	In crop.
Maturing early.	20	69	2919	1.33	35.4	36	43	2.28	2.60	68.2	68.7
Maturing medium.	25	66.4	2844	1.34	33.6	36	41	2.29	2.46	72.5	71.1
Maturing late.	9	67.3	2699	1.27	30.7	35	34	2.40	2.59	76.9	70.8
Berries, short plump.	25	67.3	2964	1.38	36.5	35	44.1	2.32	2.62	68.7	69
Berries, long slender.	20	67.7	2914	1.28	31.4	36	38.5	2.33	2.31	74.4	71.1
Berries, white.	38	68.5	2862	1.31	34.5	35	42	2.34	2.57	70.6	69.6
Berries, black.	9	66.4	3155	1.49	31.2	37	40	2.12	2.33	74.5	70.6
Berries, dun-colored.	7	63.5	2371	1.18	32.8	36	36	2.66	2.70	74.4	74.2
Panicles, open.	41	67	2769	1.30	33.8	36	41	2.31	2.63	71.2	69.9
Panicles, closed.	13	69.2	3094	1.39	33.7	34	41	2.35	2.47	73.3	70.6
Wt. per bu., 32 lb. or more. .	38	67.2	2874	1.34	35.3	35	43	2.34	2.60	70.5	69.9
Wt. per lb., less than 32 lb. .	16	68.2	2784	1.20	30	36	38	2.29	2.41	74.1	70.6
Wt. of seed per 100 berries, 2.25 grams or more.	33	67.8	2794	1.29	34.26	35	41	2.48	2.57	71.8	72.6
Wt. of seed per 100 berries, less than 2.25 grams.	21	67.1	2931	1.38	32.98	36	41	2.11	2.48	71.3	69.5
Kernel in seed, 70% or more. .	35	67.3	2787	1.30	32.49	35	39	2.36	2.49	74.2	71.2
Kernel in seed, less than 70%. .	19	67.9	2959	1.36	36.09	36	43	2.26	2.63	67.3	68.2
Kernel in crop, 70% or more. .	30	66.4	2976	1.30	33.2	36	40	2.37	2.49	73.6	72.4
Kernel in crop, less than 70%. .	24	68.8	2741	1.36	34.4	35	42	2.28	2.59	69.4	67.5

Thirty varieties have been tested for three years and 14 additional ones for two years.

The table gives the yield of both grain and straw for each year, also the rank according to yield of grain of the 30 varieties for each of three years and of the 14 for each of two years. The average yield of

YIELD OF STRAW AND OF GRAIN OF THIRTY VARIETIES FOR THREE YEARS, AND OF FOURTEEN VARIETIES FOR TWO YEARS.

Name of Variety.	Straw per acre, lb.				Grain per acre, bu.							
	1889.	1890.	1891.	Av.	1889.		1890.		1891.		Av.	
					Rank.	Bu....	Rank.	Bu....	Rank.	Bu....		
<i>30 Varieties tested 3 years.</i>												
Pringle's progress	1700	2580	2650	2310	20	40	3	48.1	2	79	55.7	
New Dakota gray	2200	3980	3760	3313	17	41.3	7	39.4	1	85	55.2	
Early Dakota	3200	2840	2682	2907	2	51.3	2	48.8	23	63.7	54.6	
Japan	2700	3660	3435	3265	4	47.5	6	40.3	4	75.8	54.5	
Texas rust proof	1600	3320	2250	2390	30	30	1	55.9	8	72.2	52.7	
Giant yellow French	2800	3300	2445	2848	1	53.8	17	34.4	15	69.2	52.5	
White bonanza	2000	2560	2950	2503	6	46.3	10	37.5	13	70.3	51.4	
Black Russian	2400	3820	2752	2991	14	42.5	5	40.6	10	70.8	51.3	
Clydesdale	2200	2960	3000	2720	8	44.1	22	33.8	7	73.1	50.3	
Improved American	2500	2660	2775	2645	3	50.3	29	25.5	5	75.2	50.3	
Prize cluster	2400	3200	3025	2875	11	42.8	11	37.2	12	70.5	50.2	
American banner	2300	2740	2430	2490	7	46.3	25	30.6	26	73.4	50.1	
Badger queen	2000	1300	3080	2127	18	40.6	9	37.8	11	70.6	49.7	
Welcome	2350	3213	3071	2878	12	42.6	8	38	17	68.4	49.7	
White Russian	2500	3220	3055	2925	10	43.4	28	26.6	3	76.4	48.8	
New red rust proof	2000	2640	2232	2291	23	36.9	4	45	21	64.6	48.8	
Common mixed	2500	3740	2270	2837	5	47.2	24	31.9	18	67.2	48.8	
Hopetown	3000	3360	2715	3025	15	42.1	12	35.9	18	67.7	48.6	
Egyptian	2300	3320	2590	2737	13	42.5	14	35.9	22	64.1	47.5	
Black prolific	2200	3800	4520	3507	24	36.9	13	35.9	16	68.7	47.2	
Probstier	2500	3260	2440	2750	19	40	15	35.6	20	65	46.9	
White wonder	2100	2540	2320	2320	16	42.1	16	35.6	26	58.7	45.5	
White Belgian	2300	3120	3270	2897	28	31.9	21	33.8	9	70.9	45.5	
American triumph	2700	3020	3050	2923	25	35.6	27	27.8	14	69.7	44.4	
Centennial	2400	2640	3125	2722	22	36.9	23	33.4	24	62.3	44.2	
Hargett's white	2400	2700	2685	2595	21	37.2	18	34.4	25	61.1	44.2	
Wide awake	2200	2720	2375	2432	9	43.8	26	28.6	27	58.3	43.6	
Canadian black	2900	4180	2965	3348	26	33.8	19	34.4	29	55.7	41.3	
Black Tartarian	2800	3960	2915	3235	29	30.6	20	33.8	28	58.3	40.9	
Virginia winter	2800	3000	2410	2737	27	32.2	30	20	30	15.9	22.7	
<i>14 Varieties tested 2 years.</i>												
Second premium white .....	.....	3200	2815	3007	.....	.....	2	41	3	72	56.5
Texas red .....	.....	2760	2470	2615	.....	.....	1	49.7	13	60.8	55.2
Improved W. Russian .....	.....	3780	3170	3475	.....	.....	14	26.5	1	80.3	53
White Swede .....	.....	2200	3225	2712	.....	.....	12	31.1	2	72.3	51.7
White Victoria .....	.....	3010	2910	2960	.....	.....	3	36.9	7	66.6	51.7
Baltic white .....	.....	3670	4150	3960	.....	.....	6	35.3	5	67.2	51.2
Black Highlander .....	.....	4000	2490	3245	.....	.....	5	36.3	10	65.9	51.1
Golden giant side .....	.....	3350	2505	2927	.....	.....	8	33.2	4	68	50.6
Canada white .....	.....	2550	3275	2912	.....	.....	4	36.4	12	63.9	50.1
Early Lackawana .....	.....	3080	2980	3030	.....	.....	9	32.8	8	66.2	49.5
White schonen .....	.....	2580	2770	2675	.....	.....	11	31.9	6	67.2	49.5
Prince Edward's Island ..	.....	2580	3280	2930	.....	.....	10	32	9	66.2	49.1
Swedish .....	.....	3320	2320	2820	.....	.....	13	30.9	11	65	48
Prolific side .....	.....	3790	2665	3227	.....	.....	7	35.3	14	56.7	46

both grain and straw is given for the two or three years, as the case may be, and the varieties of each class are arranged in order of yield of grain, beginning with the highest.

To show that no one variety is unquestionably better than all others (such extravagant claims are not unfrequently made by seedsmen), see the following table, giving the yield and comparative rank of seven varieties out of 30 for each of the three years, during which this experiment has been conducted. It will be seen that a variety which holds a high rank one year may fall to a very low one in the years following, or *vice versa*.

For example, in 1889, Texas rust proof stood at the very foot of the 30 varieties, and in 1890 ranked as the first of 44 varieties, while for this season it ranks as 15th.

VARIATIONS IN RANK AS TO YIELD OF SEVEN VARIETIES IN THREE YEARS.

Name of variety.	1889.		1890.		1891.	
	Bu. oats.	Rank.	Bu. oats.	Rank.	Bu. oats.	Rank.
New Dakota gray.....	41.3	17	39.4	7	85	1
Pringle's progress.....	40	20	48.1	3	79	2
Early Dakota.....	51.3	2	48.8	2	63.7	23
Giant yellow French.....	53.8	1	34.4	17	69.2	15
Welcome.....	42.6	12	38	8	68.4	17
Texas rust proof.....	30	30	55.9	1	72.2	8
Improved American.....	50.3	3	25.5	29	75.2	5

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THE CHINCH BUG IN ILLINOIS, 1891-1892.

The almost uniformly high temperature of the spring and summer of 1890 and 1891 in northern and in southern central Illinois, combined with light rainfall, amounting in some counties to little less than continuous drouth, favored unusually the development of the chinch bug in these sections; and, if similar conditions should prevail for another season, serious loss can hardly fail to ensue, especially in the northern part of the state.

South of central Illinois, the region threatened is a belt of counties extending from about the line of the Ohio and Mississippi Railroad northward to the latitude of Springfield, and local injury is possible for some distance north of this. To the north, the infested district is a roughly triangular area in the northeastern corner of the state, of which Stephenson County marks the western angle and Kankakee County the southern. The distribution of injury within these limits is, of course, extremely variable, as is shown by the following examples of field notes and correspondence; first for southern Illinois, and then for the northern part of the State.

WASHINGTON.—*Nashville*, July 8. "Very destructive to corn in places." Dec. 7. Bugs generally diffused in limited numbers. *Ashley*, Dec. 7. Bugs generally diffused. Injury to wheat slight; corn more hurt.

CLINTON.—*Carlyle*, April 8 and 9. Hibernating in rail fences, corn shocks, etc. Second year here. Corn and wheat suffered some in 1890. Dec. 11. A few bugs. No harm done.

MARION.—*Vernon*, July 1. "Leaving wheat for corn. Threaten injury." *Salem*, Dec. 9. A few bugs in corn. *Odin*, Sept. 27. In large quantities in one field of corn. Dec. 10. Locally abundant.

BOND.—*Greenville*, June 27. "Corn alive with them." Dec. 3. Reported present in limited numbers last season. Effects seen mostly in corn; some wheat light weight. *Smithboro*, July 10. "Destroying corn." Dec. 4. Report similar to that at Greenville. Chief injury to corn.

MONTGOMERY.—*Litchfield*, May 27. Found bugs in most wheat fields along the road for four miles south of town. Wheat damaged most on corn ground and in the vicinity of places where corn shocks had stood over winter. Eggs abundant; a few young bugs. June 2. Few eggs seen; young bugs very numerous. From ten to fifteen per cent. of wheat in vicinity where corn shocks stood is ruined. July 18. Chinch bugs very abundant in and near woodlands on gray soil. Scarce on black lands north of them. Several rows of corn killed in many fields adjoining small grains. Scattered traces of insect disease, but not sufficient to promise any important aid. Sept. 23. Bugs collected in corn fields. Every field entered contained bugs enough to excite apprehension for next year.

SHELBY.—*Herrick*, Aug. 24. Second brood of chinch bugs will seriously damage corn; many stalks completely covered. *Shelbyville*, Nov. 16. Bugs present in considerable numbers. Injuries mostly confined to corn.

CHRISTIAN.—*Morrisonville*, July 4. "Leaving wheat for corn. Threaten great damage." *Taylorville*, Nov. 17. General diffusion of bugs reported. Some wheat reduced to light weight; corn next wheat fields injured.

MACON.—*Blue Mound*, May 25. Corn and wheat infested by chinch bugs. June 27. Bugs of all ages, mostly young, present. A quart can nearly full of them sent to the office.

In addition to the above list, a general diffusion of chinch bugs is also reported, with little or no injury, from the counties of Brown, Champaign, Coles, Macon, Sangamon, Effingham, Macoupin, St. Clair, Jefferson, Wayne, Clark, Lawrence, Edwards, White, Hamilton, Randolph, Pope, and Johnson.

St. Clair, Washington, Clinton and Montgomery counties reported the bugs as being present in small numbers in 1890 also. A noticeable feature of the injury to wheat in this part of the state is that it suffered greater damage in the immediate vicinity of corn shocks, where the shocks were permitted to remain over winter.

In northern Illinois the prospect is more serious. Trips of investigation made late in 1891 showed the bugs to have been destructive locally in some nine counties for two years, and in a few places for three years past. Spring wheat, rye, and barley have afforded them the most acceptable breeding places. Destruction of these grains in areas varying from a fraction of an acre up to two, three, or more, acres was common all through the infested region; and spring wheat was frequently light in weight because of the attacks of the bugs. Oats were quite generally infested, but did not suffer so severely as the other small

grains, only now and then a small area showing noticeable injury. Corn next to spring wheat, rye, or barley, suffered considerable damage, several rows next such fields often being almost wholly worthless. Fields at a distance from the small grains contained bugs in limited numbers scattered all through them, but were not commonly damaged noticeably. The situation in these northern counties is shown more specifically in the following brief abstracts of field notes and correspondence:

McHENRY.—*Marengo*, Oct. 15. Second year of appearance. Great damage to rye, oats, and corn; some rye and corn not harvested. *Woodstock*, Oct. 16. Abundant all over the county. Wheat, corn, and barley attacked; corn not much hurt. Damage greater than last year.

BOONE.—*Belvidere*, Oct. 15. Bugs reported five miles from town, where rye was being plowed down because of them.

WINNEBAGO.—*Rockford*, Oct. 17. Abundant all through this region. Rye not much harmed; barley severely attacked; wheat and corn attacked variously. One crop of corn reported not worth gathering; another piece was half destroyed; and one field of seven acres of wheat yielded fifteen bushels gross. *Pecatonica*, Oct. 18. The bugs are in corn nearly a mile from the nearest stubble. Twenty acres of corn two miles north of town quite spoiled by bugs coming out of rye.

STEPHENSON.—*Ridott*, Oct. 19. Bugs passed from rye to corn, doing no very marked damage to either. On bottom land found bugs on corn with no stubble near. *Lena*, Oct. 20. Bugs generally present, but little complaint of injury. One farmer reports bugs in wheat, going thence into corn and damaging it seriously. *Warren*, Oct. 20. Traces of chinch bugs only.

KANE.—*Hampshire*, Oct. 14. Chinch bugs appeared here two years ago; last year in greater numbers than the year before. This year, barley, wheat, and corn damaged. Wm. Warrington had three acres of wheat destroyed, and H. Gilkerson had fifteen acres of wheat injured and three acres of corn destroyed. A neighbor of his had three or four acres of spring wheat and two or three acres of corn destroyed.

DEKALB.—*New Lebanon*, June 2. "Abundant in wheat and barley." *Genoa*, Oct. 15. Chinch bugs reported in wheat, Hungarian, and corn. They are also found in the vicinity of *Sycamore*. *Shabbona*, Oct. 20. Chinch bugs common in corn. Somewhat injurious.

OGLE.—*Davis Junction*, Oct. 14. Traces of bugs all along the road from here to Stillman's Valley. *Stillman's Valley*, Oct. 14. A few rows of corn next rye and spring wheat injured. *Payne's Point*, Oct. 15. Bugs went from rye into corn; both damaged some. Barley injured also, one acre of corn destroyed, and seven acres badly damaged. *Oregon*, Oct. 15. Five acres of corn east of town reported destroyed. *Chana*, Oct. 15. Bugs generally diffused between here and Payne's Point. Two or three acres of corn destroyed by bugs coming from rye. *Forreston*, Oct. 15. Bugs were flying thickly about this time last year. Hibernated abundantly in woods. Rye, barley, spring wheat, and corn hurt about as badly last year as this. North of town ten acres of rye was so badly damaged as to be plowed up. Five acres of corn badly damaged; much rye, barley, and spring wheat cut before it ripened to save it from the bugs. Reports from *Mt. Morris*, *Baileysville*, and *Rochelle* show the bugs to be generally distributed over the county.

WHITESIDE.—*Sterling*, Oct. 21. Chinch bugs few, no important damage.

From the foregoing it is evident that the cereal crops of a considerable part of Illinois for the coming season are in danger unless weather conditions intervene to destroy the chinch bug or to check its multiplication, and that with unfavorable weather this year, 1893 may well be dreaded throughout a large part of the state as a year of impending

agricultural disaster—all the more difficult to bear because the agriculture of Illinois, and especially that of northern Illinois, will be extraordinarily conspicuous during that Exposition year. We have, therefore, unusual reason to take prompt and thorough-going measures to ward off the injury thus threatened.

Practical measures of defence available for the coming season are limited to the present destruction of the bugs in their winter quarters; to a diminution of their food supply by intelligent cropping; to the support of infested crops by the use of fertilizers and a liberal agricultural method in general; to a destruction of the insects in small grain where they appear very abundantly in patches; to an arrest of their movement and a destruction of them as they pass from field to field at harvest; and to measures for the prompt dissemination and rapid increase of their natural contagious diseases.

The attack on the insect in its winter quarters is to be made by fire, carrying the torch in early spring over headlands, thickets, and borders of woods, and into the wintering places of the pest generally, just as far and as thoroughly as practicable. The drier the rubbish and the earth below, the more certainly will the fire reach the hidden insects. There are commonly a few warm days in spring, just previous to the spring flight of the bugs, when they are creeping actively about near the surface of their winter harborage, at which time a fire running over the ground will kill a greater number of them than if applied earlier. This operation will be more general and easy where the fences are of wire, or where an effective stock law makes fences needless.

The crops to be especially avoided in northern Illinois are spring wheat, barley, rye, Hungarian, and millet. }

To support an infested crop against the drain of insect injury the quickly acting soluble fertilizers, containing nitrogen and the phosphates, are the most desirable. The sowing of clover on wheat is a beneficial practice quite generally known to farmers.

Where the bugs settle in the fields in spring in patches, it may be a profitable practice to destroy the young there as they hatch and before they spread, even at a sacrifice of the grain if necessary. A thorough wetting of such patches with the kerosene emulsion will be effective for this purpose. It may be necessary in some cases to cover such areas with straw or dry straw-stack waste, to be burned over afterwards.

As they move from field to field their passage may be arrested and the chinch bugs killed by several procedures more or less generally known. A deep furrow plowed round the field (to be kept cleaned out by hand if necessary), in which the accumulating chinch bugs may be killed mechanically or by the kerosene emulsion is, perhaps, on the whole, the cheapest and the most effective method. A variation of this method, used very successfully in Wisconsin, is to lay fresh corn stalks in the furrow, in which the chinch bugs can be killed as they accumulate, as before, with the emulsion. To prepare this fluid, mix two parts of kerosene

with one part of strong hot soap-suds, and violently agitate the mixture with a handforce pump until a permanent cream or butter is produced. This may then be diluted with ten or twelve parts of water, and applied either from a sprinkler with a nozzle, or in a spray from a hand force pump. A minute portion of the mixture is sufficient to kill the bugs of all ages, and of the strength here recommended does not injure corn. It may be used successfully against the bugs collecting on the outer rows of corn, if they succeed in passing the barrier above described.

The fertilization of corn, either in the hill or by general application to the soil, has been proved a very considerable defence against chinch-bug injury.

The subject of the use of contagious insect diseases is still in the experimental stage, the relations of this method to various weather conditions being as yet particularly doubtful. Its promise is such, however, as to make it well worth while for any one interested to try the experiment thoroughly and carefully. For this purpose application should be made to the undersigned for material for infection, a large quantity of which we are now growing by artificial methods for distribution in the spring.

It should be thoroughly understood by everyone that isolated and individual measures, while often productive of great good, are of but little value as compared with a general, co-operative attack undertaken by all the farmers of a threatened neighborhood.

S. A. FORBES, PH.D.,
Consulting Entomologist.

All communications intended for the Station should be addressed, not to any person, but to the

AGRICULTURAL EXPERIMENT STATION, CHAMPAIGN, ILLINOIS.

The bulletins of the Experiment Station will be sent free of all charges to persons engaged in farming who may request that they be sent.

GEORGE E. MORROW,
President Board of Direction.

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